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25. Самая известная лунная фотография из миссии "Аполлон-15" снята в павильоне методом фронтпроекции

10-13 minutes

Attentive observers have long noticed such a feature of many "lunar" photographs - in them the background with the lunar landscape is separated from the foreground objects by a clear border. This is especially noticeable in the photograph from the Apollo 15 mission, which is often used to illustrate articles on "lunar" topics.

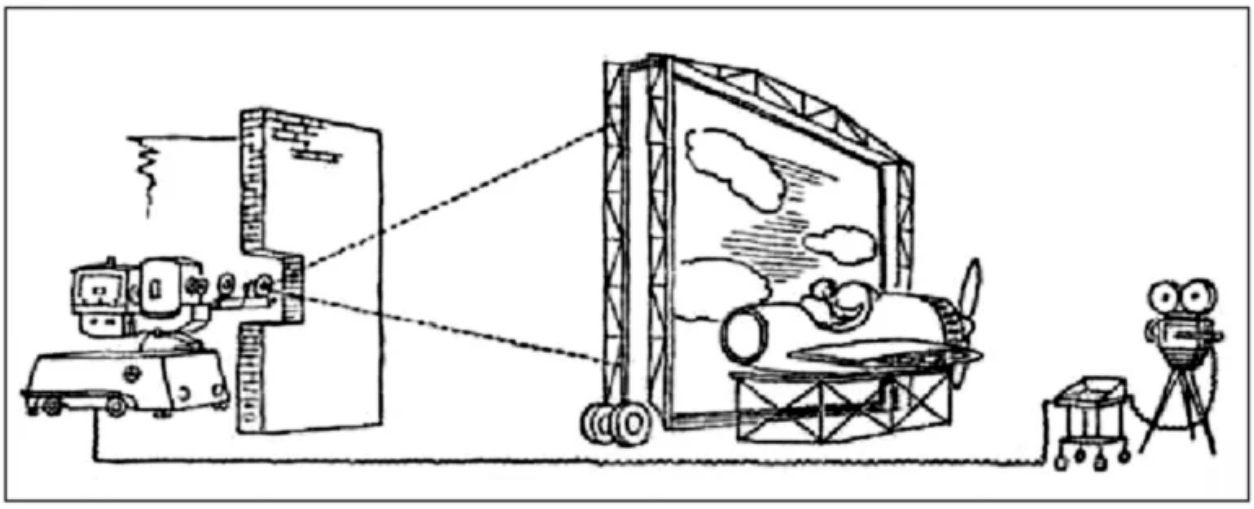
Snapshot from the Apollo 15 mission. Astronaut salutes the US flag. In the middle of the frame, behind the lunar module, there is a clear border that divides the frame into two parts.

At a distance of 7-8 meters from the shooting point, there is a stationary astronaut, to the right of him - a lunar module, an electric car, and further, at a distance of about 26-27 meters, a border appears, passing through the entire frame. Beyond this border, the texture and color of the surface changes dramatically.

According to NASA legend, in the distance in the background is Mount Hadley Delta, about 3.5 km high, to which about 9 km. However, all researchers unambiguously agree that this mountain is a flat photophone that hangs right behind the lunar module. Moon Mountain is just a drawing projected onto a movie screen. And where the vertical plane of the screen and the bulk soil of the horizontal plane converge, an interface appears.

The frame was filmed using the **front projection** method . This is a complex technology that requires a lot of careful preparation, we will now describe the details of this technology. Since the preparation of the frame and the shooting itself lasted for several days, instead of a real astronaut, there was a dummy in the frame, which could stand motionless for many hours (or even days).

In those years, the technology of combining the actor with the background called keying was widespread in cinematography. The name "rear" comes from the English word "rear" - behind. A movie camera filmed the acting scene from one side of the screen, and images (for example, a street view or a shot with clouds) were projected onto a translucent screen from the other side, from behind. Note how big the projector was.

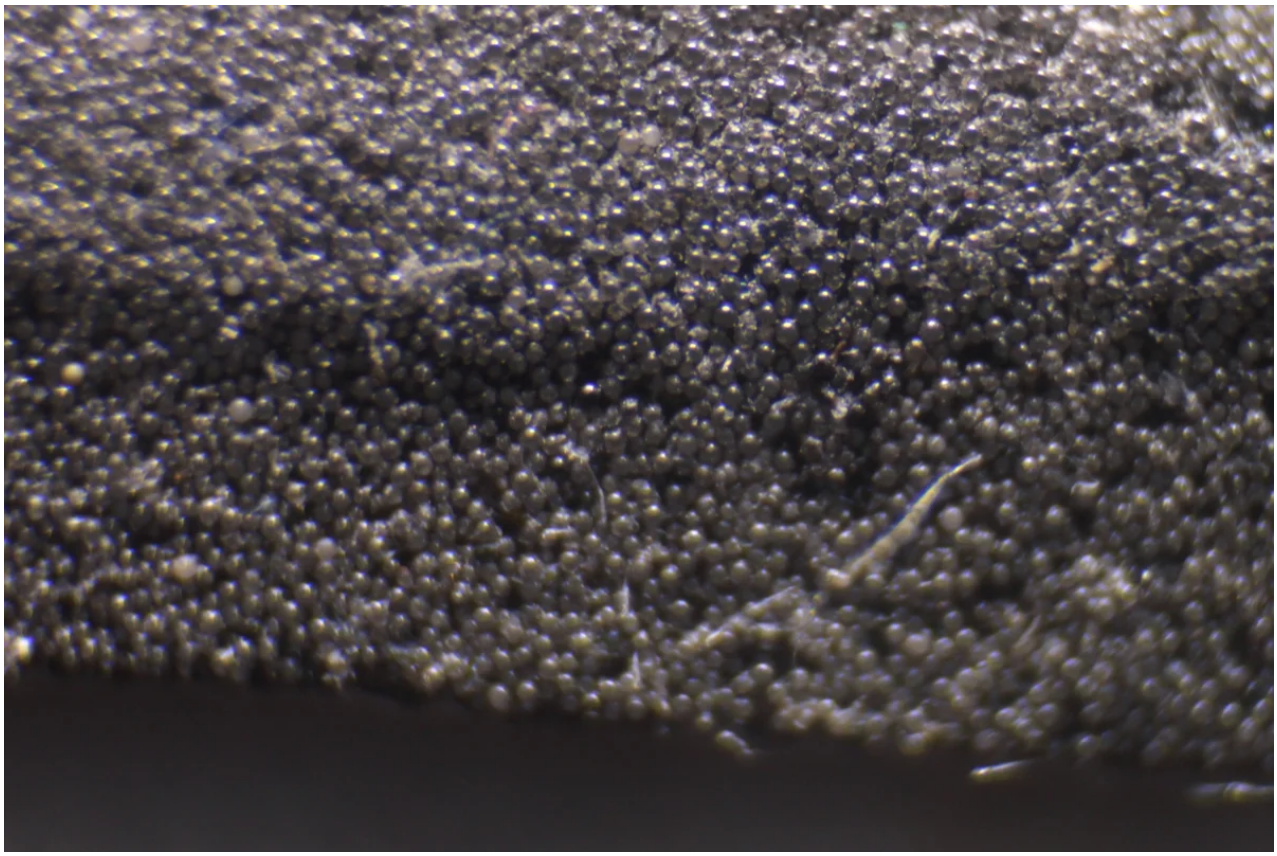


General view of the survey using the keying method. On the left (behind the screen) is a projector, on the right is a movie camera.

The sensitivity of color films in those years was very low, so the acting scene had to be brightly highlighted. Accordingly, the back of the screen must also have a very high brightness, much (many times) higher than in a conventional cinema. And this can be achieved only if the size of the cinema screen is no more than 5 meters in width. Therefore, the key projection method was mainly used to shoot medium-sized shots, for example, a conversation in a car while driving through the city. The car stood motionless in the pavilion, and the previously filmed moving background outside the windows was projected onto the movie screen.

A scene from A. Hitchcock's film "The Man Who Knew Too Much". Rear projection.

Another method, **front projection** ("front" - front lighting) allowed to increase the size of the screen against the background up to 32 meters wide. But for this I had to use a special screen, consisting of the smallest glass balls (along a line of about 300 balls per inch).



Macro photography. Reflective screen.

When light hits a glass ball, it bounces off the back surface and returns back to the light source, which is why such materials are called retroreflective materials. In fact, it is a screen consisting of the smallest mirrors.

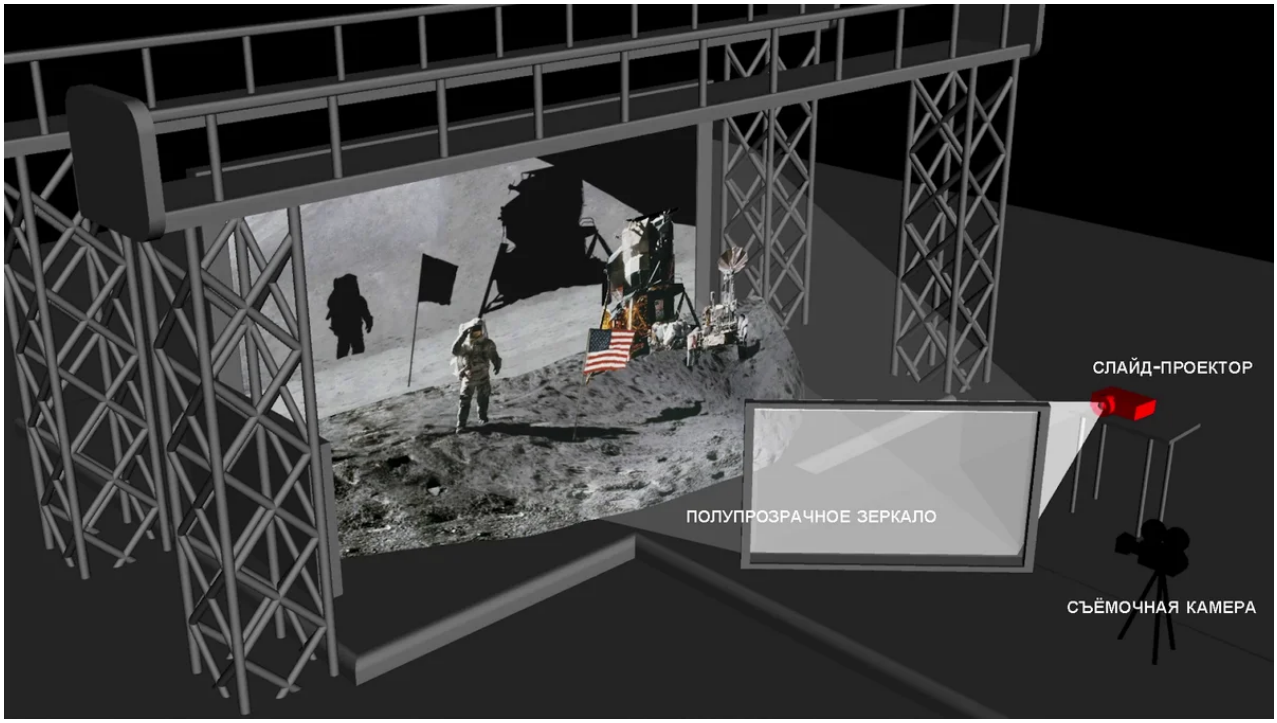
Retroreflective materials are used for the manufacture of road signs, car numbers, and are used in the form of stripes on overalls. Reflective fabric looks gray in diffused light, but shines brightly in directional light.

Reflective fabric in diffused light is gray (left frame), in directional light it becomes brighter than a white shirt (right frame).

When such a material is illuminated by light from the headlights of a car, then the light, reflected from the material, is not scattered in all directions, but almost completely returns back to the headlights, to the driver. Because of this, road signs appear very bright at night.

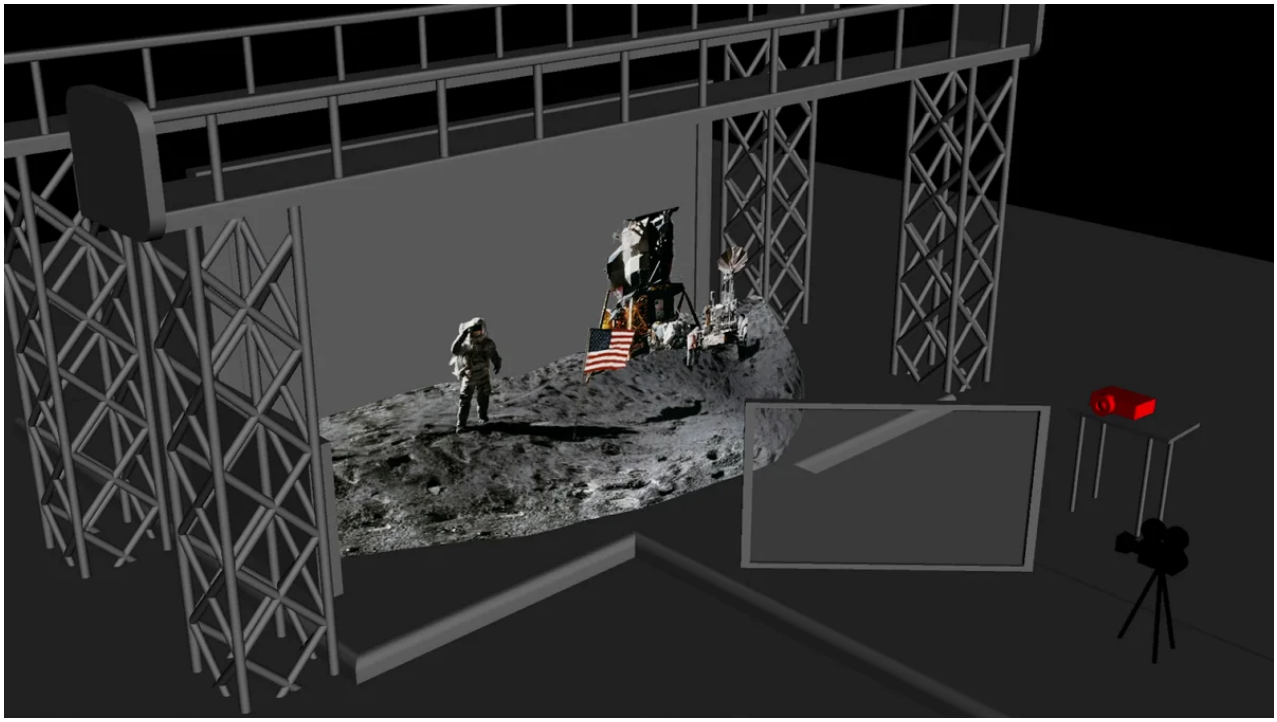
A cinema screen made of such a material, with a directional light, will be 100-120 times brighter than a white sheet of paper. Therefore, we can increase the screen area by almost 100 times! And then the brightness of the image on the reflective screen (in the background) and the brightness of the object in front of the screen (in the foreground) will become comparable. The feeling will be created that we have a single object in front of us. But such a maximum brightness on the screen will be seen by only one person who is near the light source, i.e. next to the projector. And the closer the observer gets to the projector lens, the brighter he will see the image on such a screen. It is physically impossible to put the camera in the place where the projector lens is located - they will overlap each other. Therefore, a translucent mirror is used and the camera is combined with the reflection of the projector in the mirror.

A side-mounted slide projector with a "lunar" mountain slide installed shines into a translucent mirror located at 45 ° to the plane of the screen and casts an image onto the screen. Since the astronaut and lunar module are not transparent, there will be shadows from them on the vertical screen.



Front projection scheme for shooting a frame in the Apollo 15 mission.

Reflected off the screen, the light returns to the mirror. Half of the light flux is deflected by this mirror at 90 **°,** goes back to the projector, and the other part of the light flux (the mirror is translucent) goes in a straight line and enters the camera lens.



The slide projector is off.

The astronaut is illuminated so that the light from a searchlight simulating the sun does not hit the screen. In almost all "lunar" photographs, where there is a mountain in the background, the astronaut is illuminated in the back, the light is back-side.

For those who asked themselves the question: why do we not see shadows on the background of the screen in the "lunar" images? - I will answer very simply. As we get closer to the camera setup point, the astronaut's

shadow begins to hide behind the figure itself.

The shadow, visible from the side, begins to hide behind the figure of the astronaut as it approaches the camera.

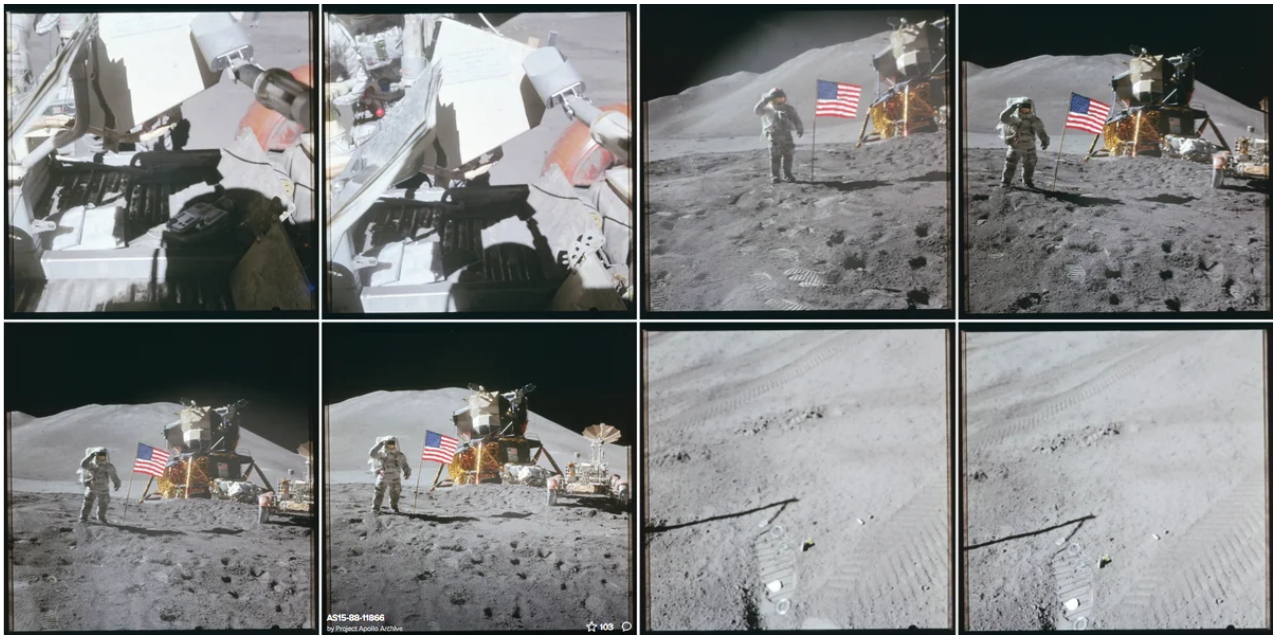
Thanks to the translucent mirror, the filming camera and the projector are, as it were, at the same point, the distance from the projector to the mirror and from the camera to the mirror is strictly the same.

The shadows are hidden by the objects themselves.

The camera and the projector are positioned strictly symmetrically relative to the mirror. Basically, the camera, projector and mirror are mounted on the same platform so as not to be out of alignment. It turns out a whole installation weighing more than a ton. And this installation cannot move closer or further relative to the screen, since in this case the brightness on the screen will change, the difference relative to the foreground ground and

the astronaut's brightness will be noticeable. Therefore, once the set distance from the camera to the screen does not change.

You probably thought that these images in the Apollo 15 mission (there are four takes) were shot with a light "hand-held" Hasselblad camera? No, no. The shooting was carried out with a bulky stationary installation. The camera could only pan slightly left or right. Therefore, in a series of shots, we do not see intermediate frames taken from different distances.



Eight consecutive frames in album # 88 of Apollo 15: as15-88-11861 ... 11868

Logically, if the astronaut actually ended up on the moon, then, moving away from the rocket, he would take several pictures in succession: for example, first there would be a picture near the lunar module, then, after going a few steps, a series of pictures with the astronaut would appear in the foreground and the lunar module behind him, then, having retired a few more steps, the photographer would make a couple of general plans "for all mankind" with a small astronaut figurine and a lunar module in the distance. But we do not see such a sequence of shots, instead, all shots (and the same thing in other Apollo "expeditions") are shot in the same way from the same distance, in the same angle, and then, in the same set boundaries the necessary "elements" fit into the frame (put into the frame): a mountain in the background, a lunar module,

Pay attention to those photos that precede the photo session of 4 shots - these are shots taken in a different place and at a different time: this is either a close-up part of the rover, or large footprints in the sand in some other place. The shots with the lunar module against the background of the lunar mountain stand in isolation from all material.

The only thing the camera could do was pan slightly left or right. The width of the screen was 32 meters, and the frame included 23-24 meters. Therefore, the camera could make a left-right panorama about 1/3 of the frame width, no more.

To create the feeling that an astronaut with a camera is approaching or moving away from the subject of photography, they did what was worked out in the cinema - a large platform with the astronaut was moved relatively to a fixed screen.

So, the analysis of 4 consecutive images from the Apollo 15 mission unambiguously indicates that these are combined surveys performed in the pavilion using the front projection method. An image of a lunar mountain was projected from a slide projector onto a giant screen 32 meters wide. In front of this screen, sand was poured in the pavilion, imitating lunar regolith. In all the images, the border separating the vertical plane of the screen from the horizontal plane of the filled soil is clearly visible. The distance to this border is approximately 26-28 meters. Since the shooting took a lot of time, instead of a real astronaut, a dummy was used, which could stand still for several hours while certain changes were made to the frame (additional footprints were made on the sand, shifted the platform relative to the screen, waited for the development results, etc.). The dummy was lightweight (about 28-30 kg) to depict the astronaut's weight loss on the moon and light ground pressure. To prevent the light from a spotlight simulating the sun from illuminating the image on the movie screen, the spotlight was directed away from the screen. Therefore, the "astronaut" in the frame with the mountain in the background (as in other "lunar expeditions") is illuminated by a back-side light.

*

Cameraman L. Konovalov was with you

Until next time!